(17)

17th Plant Development Workshop

You are invited to attend the 17th Plant Development Workshop to be held at the Scarborough Campus of the University of Toronto, Saturday, April 12, 1986. Please extend this invitation to those in your department who are interested in plant develpment but who might not be on our mailing list.

Preliminary schedule

9:00 - 9:30 a.m.	Coffee and registration
9:30 - 12:00 noon	Contributed papers
12:00 - 2:00 p.m.	Lunch and poster session
2:00 - 4:00 p.m.	Contributed papers

A map to the Scarborough Campus is enclosed. Take the Morningside Avenue exit south off of Highway 401. Turn left off Morningside Ave. onto Military Trail at the first stop light. On crossing Ellesmere Road prepare to turn right shortly into the main entrance of the campus. Proceed to parking lot B and enter the H-Wing entrance to the building.

Please use the attached form to send titles and abstracts for delivered papers (15 minutes) and posters (limited space available). I would appreciate receiving 1) abstracts, 2) an estimate of the number of people attending from your lab, and 3) any requirements for accomodation as soon as possible - not later than April Fool's Day if possible!

Looking forward to seeing you.

Dr. Ron Dengler
Life Sciences Division
Scarborough Campus
University of Toronto
1265 Military Trail
West Hill, Ontario M1C 1A4

(416) 284-3218

(17)

THE 17TH PLANT DEVELOPMENT WORKSHOP

Saturday, April 12, 1986

Scarborough Campus
University of Toronto

9:00 - 9:45	Registration and coffee, Faculty Lounge, room H-403. (Contributed papers in room H-214).
9:45 - 10:05	Morphology and adaptation in anisophyllous shoots. Arturo A. Sanchez-Burgos, University of Toronto.
10:05 - 10:25	Cell wall formation in the female prothallus (gametophyte) of *Pinus banksiana* Lamb. Mary I. Moore, Deep River.
10:25 - 10:45	Does the exodermal Casparian strip constitute a barrier to the diffusion of ions? Carol A. Peterson, University of Waterloo.
10:45 - 11:05	Floral development of *Basella rubra* L. Christian Lacroix, McGill University.
11:05 - 11:25	Coffee
11:25 - 11:45	Development of a mycorrhizal association between *Lotus corniculatus* and *Glomus versiforme*. D. Blair and R.L. Peterson, University of Guelph.
11:45 - 12:05	Dynamic microfilament arrays in plant cells. Robert W. Seagull, Marcia Falconer and Carol Weerdenburg, Carleton University.
12:05 - 12:25	Determination of secondary wall patterns in tracheary elements by interphase microtubule arrays. Marcia Falconer and Robert Seagull, Carlton University.
12:25 - 2:00	Lunch and Poster Session, Faculty Lounge, room H-403.
2:00 - 2:20	Differences in cell size, cellular-protein and cellular-RNA content of sister cells in root meristems. S.W. Armstrong and D. Francis, McMaster University.
2:20 - 3:00	Maize inflorescence culture, an update: 1) review and report on its use in anther embryoid production, 2) tassel culture and pollen production, 3) use of ear primordia to study the control of sexuality. R.I. Greyson, V.R. Bommineni and P.R. Preddy, University of Western Ontario.
3:00 - 3:30	Reception in Faculty Lounge, room H-403.

Posters (room H-403):

Host effect on the morphology of the VAM fungus, Glomus versiforme
S.M. LACKIE, M.L. GARRIOCK and R.L. PETERSON
Department of Botany, University of Guelph, Guelph, Ontario N1G 2W1

Four species of vascular plants were colonized by the same species of a vesicular-arbuscular mycorrhizal (VAM) fungus, Glomus versiforme. Leek, wheat, alfalfa and sunflower plants were grown in culture pots containing G. versiforme associated with leek roots. The plants were grown in the culture pots for 6-10 days after which the roots were excised, cleared in 10% KOH and stained in Chlorazol Black E. The fungal structures on and within the host roots were examined to determine the effect of the host on the morphology of the fungal structures. Arbuscule shape and fungal branch diameter within the arbuscules differed between the four host species. Appressoria differed among the species; leek, wheat and sunflower had simple appressoria while those in alfalfa were elaborately lobed. Vesicle shape was more consistent: all four species usually had elliptical-shaped vesicles. Wheat, however, occasionally produced oblong vesicles.

Variations of Dryas/Hebeloma Ectomycorrhizae
L.H. MELVILLE, H.B. MASSICOTTE and R.L. PETERSON, Department of Botany, University of Guelph, Guelph, Ontario N1G 2W1.

Infection of Dryas integrifolia, a boreal genus in the Rosaceae, with the ectomycorrhizal fungus Hebeloma cylindrosporum resulted in the formation of morphologically and structurally different mycorrhizae. Variations occurred in the size of the root meristem, the number of cortical cell layers, shape of root cells, the depth of the Hartig net, and the mantle thickness. The changes may be dependent on the age of the symbionts, distance of initial infection from the root apex, and whether the mycorrhiza occurred on a primary, long lateral or short lateral root.

DOES THE EXODERMAL CASPARIAN BAND CONSTITUTE A BARRIER TO THE DIFFUSION OF IONS? Carol A. Peterson, Department of Biology, University of Waterloo.

While on sabbatical leave, in the laboratory of M. Pitman at the University of Sydney, I tested the permeability of the onion root exodermal Casparian band to sulfate ions to determine whether the previously-observed dye blockage reflects the movement of ions. The hypothesis was that if the exodermal Casparian band were impermeable to sulfate, the sulfate free space should equal the free space of the epidermis but if the Casparian band were permeable to sulfate, the sulfate free space should equal the free space of the epidermis plus cortex. The sulfate free spaces were measured by an elution method in (a) bisected root segments with their steles removed, and (b) root segments with cut ends sealed with sticky wax (10 segments, 20 mm long). The free space in the former was 10.13 µL while the free space in the latter was 2.80 µL. Total wall volumes were 16.07 µL for the epidermis plus cortex, and 4.21 µL for the epidermis alone. Thus, the sulfate free space was about 65% of the total wall volume in each case. The ratio of sulfate free spaces (a/b above) = 3.62. The ratio of wall volumes epidermis + cortex/epidermis = 3.81. The results are therefore consistent with the hypothesis that the exodermal Casparian band of onion is impermeable to the diffusion of sulfate ions.

Dynamic Microfilament Arrays in Plant Cells. Robert W. Seagull, Marcia Falconer and Carol Weerdenburg. Dept. of Biology, Carleton Univ

The study of actin-like microfilaments (mfs) has been facilitated by the use of phallotoxins; fungal metabolites which specifically bind filamentous actin. By using fluorescently labelled phalloidin we have examined, at the light microscopic level, the three dimensional distribution and reorganization of mfs during the cell cycle and differentiation. At interphase, mfs are organized into three distinct yet interconnected arrays:]) fine peripheral networks close to the plasmalemma; 2) large axially oriented cables in the sub-cortical region; 3) a nuclear 'basket' of mfs extending into the transvacuolar strands. All these arrays, beginning with the peripheral network, disappear at the onset of mitosis and reappear, beginning with the nuclear basket, after cytokinesis. During the mitotic and cytokinetic events, mfs are associated with the phragmoplast and perhaps the spindle. The nuclear region appears to be the center for mf organization and/or initiation. During differentiation from rapid cell division to cell elongation, mf arrays switch from an axial to a transverse orientation, thus paralleling the microtubules. This change in orientation reflects a shift in the direction of cytoplasmic streaming. These observations show for the first time that actin-like mfs form intricate and dynamic arrays which may be involved in many as yet undescribed cell functions.

ABSTRACTS

Contributed papers (room H-214):

Morphology and adaptation in anisophyllous shoots.
ARTURO A. SANCHEZ-BURGOS. Department of Botany, University of Toronto, Toronto, Ontario M5S 1A1.

Anisophyllous shoots are found in many taxa of vascular plants. Anisophylly is associated with prostrate growth and is characterized by the reduction of one leaf an opposite pair either from inception (habitual anisophylly) or by an optional inhibition of growth during the period of leaf expansion (facultative anisophylly). Anisophyllous shoots are believed to increase the efficiency of light reception by avoiding overlap of adjacent leaves. In facultatively anisophyllous shoots leaf arrangement mimics alternate phyllotaxis while retaining the ability to develop decussate leaf arrangement under appropriate environmental conditions. In this case, the basic vascular pattern of the shoots may not be modified by the degree of anisophylly, as happens in Pentadenia orientandina (Gesneriaceae). In some families such as the Gesneriaceae, anisophylly may be associated with the transition from terrestrial to epiphytic habitats. Frequently within anisophyllous shoots, the arrangement of floral buds in the axils of large ventral leaves and of vegetative buds in the axils of small dorsal leaves maintains the potential for sexual reproduction and vegetative growth at the same node.

Cell wall formation in the female prothallus (gametophyte) of Pinus banksiana Lamb. Mary I. Moore , Box 159, Deep River, Ontario.

Sokolowa's 1890 description of cell wall formation in the female prothallus (gametophyte) of gymnosperms, accepted for the past 100 years, does not agree with present observations made during a glutaraldehyde - glycol methacrylate study of P. banksiana . Evidence will be submitted and two possible alternate theories will be discussed. Audience participation requested.

Floral development of Basella rubra L. -Christian Lacroix

The flower of Basella rubra L. presents us with two morphological problems: a) superposition of stamens and tepals b) basal placentation. a) The first problem is a phyllotactic one. If we consider the classical definition of the flower (a modified monaxial shoot bearing fertile and sterile phyllomes), existing phyllotactic theories could be used in an attempt to explain the arrangement of phyllomes on the floral axis. However, an investigation of the spatial-temporal pattern of tepal-stamen initiation shows that existing phyllotactic theories do not adequately explain the phenomenon of superposition. Hence, a change in phyllotactic theorizing and/or the interpretation of the flower appears to be necessary. b) The second problem concerns the carpel concept. A carpel is traditionally defined as a folded phyllome that bears and encloses ovule(s). If this definition is applied to the gynoecium of B. rubra it is acarpellate because the single bitegmic ovule forms directly from the floral apex. If the term carpel is redefined as a gynoecial appendage that encloses ovule(s), then the gynoecium of B. rubra is carpellate. The basal ovule remains, however, cauline.

Development of a mycorrhizal association between Lotus corniculatus and Glomus versiforme

D. BLAIR and R.L. PETERSON
Department of Botany, University of Guelph, Guelph, Ontario N1G 2W1

Lotus corniculatus seedlings were transplanted into pots containing leek (Allium porrum) plants that were colonized with a vesicular-arbuscular mycorrhizal fungus, Glomus versiforme. Colonization of Lotus roots started within 3 days after planting. External mycelium was limited. Appressorium-like structures formed on epidermal cells and penetration was characterized by constriction of hyphae as they passed through cell walls. Intercellular hyphae with radially-oriented pegs were very extensive. Intracellular coils of trunk hyphae were located predominantly in the outer cortex. Arbuscules formed within 4 days and occupied most of the host cell when mature. Oval-shaped intercalary and terminal vesicles were observed after 10 days. Vesicles and arbuscules were most abundant in the inner cortex.

Determination of Secondary Wall Patterns in Tracheary Elements by Interphase Microtubule Arrays. Marcia Falconer and Robert Seagull, Dept. of Biology, Carleton Univ. Ottawa, Ont.

In Zinnia suspension cultures, two general categories of secondary wall patterns can be found in differentiating tracheary elements (TEs): bands and webs. Band patterns are found in elongated cells or regions of cells, webs in isodiametric cells or regions of cells. Under standard growth conditions, 95% of TEs have elongated shapes with predominantly band wall patterns while less than 5% of TEs consist of isodiametric cells with web patterns. By growing cells in the presence of APM, an herbicide which depolymerizes microtubules (mts), the incidence of isodiametric cells is raised to 80% of the population. Upon removal of APM, mts repolymerize in random arrays in these cells. Subsequent TE differentiation results in the formation of web patterns. These results provide support for the hypothesis which states that interphase mt arrays, organized in the period before differentiation, determine both cell shape and secondary wall pattern in TEs. Lateral association of these interphase mt arrays, possibly due to a differentiation specific microtubule associated protein (MAP), may be the mechanism behind the formation of the mt groups which precede and predict secondary wall pattern formation in tracheary elements.

DIFFERENCES IN CELL SIZE, CELLULAR-PROTEIN AND CELLULAR-RNA CONTENT OF SISTER CELLS IN ROOT MERISTEMS. S.W. Armstrong and D. Francis, McMaster University, Hamilton, Canada L8S 4K1.

When cells in mitosis complete division the two daughter or sister cells produced are rarely of equal size. In Cocos nucifera L. the cell area ratio of the larger to smaller sister is 1.17:1. Sister cells also show differences in their nuclear area (1.15:1), cellular-protein (1.23:1) and cellular-RNA content (1.37:1). Plots of the cumulative distribution frequencies for the ratios of sister cells area, protein content and RNA content were not identical. These results suggest either that the distribution of cellular-RNA and cellular-protein at mitosis is not only unequal but is also disproportionately unequal relative to the asymmetry for sister cell size or that the ability to synthesize RNA and protein is dissimilar in sister cells; it is also possible that both processes are involved.